Similarity relations in radiative transfer

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Several quasi-invariant quantities in radiative transfer concerning multiple scattering, which were originally introduced by van de Hulst [1], can be derived from the equation of radiative transfer. Recently, it is shown that the aforesaid quasi-invariant quantities are useful in remote sensing of ice cloud properties from spaceborne radiometric observations [2]. Specifically, the overall performance of an ice cloud optical property model can be estimated without carrying out detailed retrieval implementation. In this presentation, we will review the radiative transfer similarity relations and some recent results. Furthermore, we will illustrate an application of the similarity relations to improvement of broadband radiative flux computation [3]. For example, the Rapid Radiative Transfer Model (RRTM) [4] does not consider multiple scattering in the longwave spectral regime (RRTMG-LW). It is shown that the similarity relations can be used to effectively improve the accuracy in computing radiative flux by incorporating the mu-tiple scattering effect without an increase in computational effort.

References

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